Expedition studies acid impacts on Arctic

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This is RRS *James Clark Ross*. Credit: University of Southampton

The effects of ocean acidification on Arctic seas will be studied by a team of 30 researchers, including Dr Toby Tyrrell from the University of Southampton, who set sail from the UK today (1 June), venturing as far north as polar ice allows.

The study is the largest ever to examine the effects of altering carbon dioxide (CO_2) levels in "real world" seawater samples directly after they are collected at sea.

Polar seas are expected to be especially sensitive to the effects of ocean acidification, since more CO_2 dissolves in cold water, making Arctic waters a valuable natural example of how the marine environment will respond to a high CO_2 world. Also, the chemical sensitivity of surface seawater in the Arctic means that it will become corrosive to calcium

carbonate before anywhere else in the world. This could pose a serious problem for marine plankton and other organisms that use calcium carbonate for their shells or skeletons.

During the expedition, the scientists will study the impact of the changing chemistry on marine organisms and ecosystems, the cycling of carbon and nutrients in the sea and how the sea interacts with the atmosphere to influence climate. The scientists, from eight laboratories, will be collecting seawater samples from both the open water and gaps in the sea-ice in the Norwegian, Barents and Greenland Seas.

Two approaches will be used in this study. Firstly, the researchers will look at how ecosystems vary between areas where the chemistry of seawater is naturally more acidic or alkaline. By contrasting the observations over a range of different conditions, insights researchers will discover how acidification may affect organisms living in their natural environment, where natural selection and adaptation have had time to play out.

The second approach is experimental, using tanks of natural seawater collected from the upper ocean and brought into controlled conditions on deck. This natural seawater will be subjected to various levels of CO2 that are likely to occur in the future. The expedition, aboard the RRS James Clark Ross, which is operated by the British Antarctic Survey, will end on 4 July in Reykjavik, Iceland.

Dr Toby Tyrrell from the University of Southampton, who is based at the National Oceanography Centre, Southampton, is coordinator of the Sea Surface consortium says: "Following our cruise last year to the northwest European shelf, this second cruise will visit the more remote Arctic Ocean which may well be more seriously affected by ocean acidification. The data collected will improve our understanding of future impacts, providing important information about the consequences

of continuing to burn fossil fuels in enormous quantities (atmospheric CO2 is already 40 per cent above its preindustrial level, and still climbing). Our final cruise, in six months' time, will visit the other polar ocean, the Southern Ocean."

Dr Ray Leakey, Arctic Research Theme Leader at the Scottish Association for Marine Science (SAMS) and the leader of the current expedition adds: "Few studies have investigated the effects of ocean acidification on the marine food web of the remote Arctic seas, and most have focused on laboratory cultures or natural communities from a limited number of relatively accessible coastal locations. By contrast our expedition will be by ship in both ice-covered and ice-free oceanic waters far from land. This will allow us to undertake the most comprehensive study to date of the ways in which the plants and animals living in the surface waters of the Arctic Ocean respond to acidification."

The global ocean has absorbed about a third of the total CO2 produced by human activities in the past 200 years. This uptake of CO2 has greatly slowed the rate of human-driven climate change. It is also responsible for major changes to ocean chemistry, known as ocean acidification, with potentially serious implications for marine life.

More information: Members of the team will be blogging about their progress at www.arcticoacruise.org
You can also follow their progress on Facebook www.facebook.com/ArcticOceanAcidificationCruise and Twitter @arcticoacruise

Provided by University of Southampton